EXPERIMENTS ON PORTLAND AND ROMAN CEMENTS.

In continuation of the report in our last number, we now give an account furnished us of other experiments on Portland and Roman cements, of Messrs. White's manufacture, with a view to ascertain their comparative adhesiveness to various sorts of stone. The stones operated on were all 6-inch cubes, and were cemented together by a joint ½ inches thick, of neat cement. After being allowed a certain time to harden, the joint was torn asunder by a dead weight applied gradually to the lower stone.

Description of Stone.	Age of cement joint in days.	Weight in lbs. that tore joint asunder.	Average adhesiveness in lbs.	Adhesion per square foot in tons.	REMARKS.
1. Portland stone united with Portland cement	10	3,684*	apparatus broke		It was not till the third trial that this pair of stones could be separated.
	15	3,764*	ditto	do.	
	30†	4,526			
2. Portland stone and Portland cement	56‡	6,000	5,263	tns. cwt. 9 8	Broke at the joint, bringing away from upper stone a thickness of 1-8th of an inch, adhering as a coating on the cement face.
3. Aberdeen granite and Portland cement	50	3,593	..	..	Broke at joint, many particles of granite adhering to cement face.
4. Cornish granite and Portland cement	40	3,277	..	..	Same remark applies.
5. Bramley fall-stone and Portland cement	50	2,738	..	..	The stone gave way before the cement, the fracture only partially revealing the joint.
6. Whitby (Egton) stone and Portland cement	50	2,188	2,048	..	Stone gave way, leaving a coating of stone on cement joint, 3-8ths of an inch thick over half the area.
	30	1,908			
7. Kentish rag-stone and Portland cement	10				These stones, exceedingly hard and refractory, and appearing to have very little absorbing property, broke at joint without fairly bearing the weight of apparatus.
	40	..	..	..	
8. Kentish rag-stone and Roman cement	21	1,455	1,027	..	The result of these two experiments seems to show, that after a certain date, say 20 to 30 days, age does not increase the adhesive power of Roman cement in connection with stone.
	56	600			
9. Portland stone and Roman cement	21	965	896	..	
	56	818			
10. Aberdeen granite and Roman cement	21	804	811	..	
	56	818			
11. Cube of Portland cement, 6 in. each way	66	2,183	..	..	Separated across the middle at this weight.
12. Cube of Portland cement with 1 part sand	66	1,319	..	..	Ditto.
13. Cube of Roman cement neat	66	1,227	..	..	Ditto.

From these experiments it is to be observed, that the adhesiveness of *Portland* cement is greater to *Portland* stone than to any other description of stone; the average of two trials giving a force of 9½ tons as necessary to tear asunder two blocks of 1 foot square on the cemented surfaces.

On comparison, it appears that the adhesiveness of Portland cement to Portland stone is, as contrasted with that of Roman cement to Portland stone, 6 to 1; and of Portland cement to granite, as contrasted with Roman cement to granite, 4½ to 1.

In addition to experiments on crushing and adhesion, various trials have been made on Portland cement exposed in connection with bricks to transverse strain. The result is said to shew a superiority, at the end of three to four days, of two to one in favour of Portland; but at a fortnight old the gain in strength of Portland over Roman is very considerable; Portland cement with four sands, being then more than double the strength of Roman with one sand.

The following trials upon the absorptive properties of Portland cement shew its adaptation for hydraulic purposes:—

"A piece of Portland concrete stone, 3 inches thick, six weeks old, weighing 81½ lbs., was steeped in water for twenty successive days, and weighed every fourth day. It ceased to absorb water after the twentieth day, and the total gain in weight was 3½ lbs., being at the rate of 4 per cent.

Six hard pavior bricks, unitedly weighing 33 lbs., or 5 lbs. 8 oz. each, were treated in a similar way; and weighed every other day. The absorption ceased after the eighth day, and the total gain in weight was 2 lbs. 1½ oz., or 5½ oz. per brick, being a gain of 6½ per cent.

Six good hard grey stocks, weighing unitedly 32 lbs. 7 oz., or 5 lbs. 6½ oz. each, were subjected to the same process, and on the eighth day gained their maximum of increase, which amounted to 3 lbs. 3½ oz., or 10½ oz. per brick, being at the rate of 11½ per cent.

* Bore without breaking.
† Half of block, No. 1, in possession of Mr. Rendell.
‡ Half of block, No. 2, in possession of Mr. Walker, who saw it broken.

MEDIÆVAL FREEMASONS' SYMBOLS.

SIR,—Having been frequently pleased with your remarks relative to the scientific attainments of the mediæval architects, I am induced to send you the accompanying observations on an assertion made by a learned professor.

In the "Kölner Domblatt" for February, 1848, there is an article on German mediæval architecture, being part of a lecture delivered for the high city school at Görlitz, by the royal professor and director, Herr Fred. Wilhelm Kauman. The parts of the lecture given in the "Domblatt" are on the "Lodges of the Middle Ages," and "Symbolism of Mediæval Architecture," both of which portions are treated in a most interesting as well as learned manner. But there is *one* assertion made by the professor with which I was at first much delighted, but subsequent examination of the subject has proved, at least I think so, that I was too credulous, and also that there are professors, even in this scientific age, whose geometrical attainments, to say nothing of any other, are certainly not superior, probably much inferior, to those of the mediæval architects. The assertion to which I allude is in the following sentences:—

"The theory of architecture was maintained by signs and sayings in the memories of the brethren as long as those secret lodges existed. Whilst, for example, the Pentagon, composed of three interlacing triangles, the Pentalpha, or five-fold A, the Pentagramma, Alpkreuz or cross A, or Druidenfuss, made use of by the Pythagoreans as a countersign, who placed it in the beginning of their letters, instead of the usual salutation (salus Pythagoræ) which the Druids also carried on their shoes as a symbol of the Deity, was superstitiously considered, only as a sign of safety, or welfare, and hence sometimes the words *salus*, or *hygia*, were written in the corner of the Pentagramma.—this symbol was, in particular, drawn on cradles, thresholds, doors, more especially stable-doors, in order to keep away the wizards and witches.—whilst, I say, this very ancient figure has been retained even to this century as a sign of protection against demoniacal powers, the Freemasons, whilst contemplating the geometric figures, considered it as a symbol of deep wisdom. The lines of the triangle forming the pentagon intersect each other in constant proportion. If we make a circle to pass through these points of intersection, the diameter of this circle will be equal to the side of the octagon inscribed within the circle which circumscribes the pentagon," *i. e.*, the diameter *o n* is equal to the side of the octagon A *a*.—See the accompanying diagram.

The last sentence of the extract is the one in question. There is no diagram given in the "Domblatt," but although the German is obscurely expressed, yet I think there can be no doubt of the professor's meaning. If the true meaning be what I have given, then it follows, if I am right in the accompanying examination of the relative properties of the pentagon and octagon, that the assertion of the professor does not embody a fact.

In case you may not have at hand the "Domblatt," I subjoin the exact words of the professor.

"Setzt man in den Durchschnitts-Punct den cirkel, so gibt der Durchmesser des kreises das Achteck des grossen kreises, worin das pentagon construirt ist."

It seems to me that "den Durchschnitts-Punct," should have been "die Durchschnitts-Puncte," *i. e.*, plural instead of singular, otherwise, if we take "Durchschnitts-Punct," for the centre of the circle, and the word "cirkel" for the compasses, which I believe is warrantable, we want to know what is to limit the small circle (kreis): however, the diagram will, I think, make the professor's meaning quite clear. If one judged according to appearances alone, it would be very difficult to dispute the assertion in question, for the line *a b* would, in all moderately sized diagrams, seem to coincide exactly with the tangent *b c'* to the small circle; but supposing we are not content with appearances, and would call that powerful spirit *demonstration* to our aid, we shall find that there is real separation between the points *c* and *c'*, the distance of which is nearly the $\frac{1}{11}$th part of S *c*, very little certainly, but enough to prove that the professor's assertion does not embody a *fact*.

If we divide the results obtained geometrically for the side of the octagon and radius of the semicircle by 4 in each case, and extract the square roots, the result will be seen to be precisely like those obtained by trigonometry.

I dare say that I have by this time made you heartily sick of so dry a subject; but it has been thought fitting that we should sometimes, if not always, penetrate a little beyond the mere superficies of objects. I imagine those mediæval architects did so, notwithstanding what may be said by some of our great men (whose opinions, by the bye, it were treason to suspect) of the unscientific, bungling, yet lucky way in which they managed to produce so many gigantic specimens of artistical and mechanical skill.

I shall be glad, of course, to be set right if I have failed in proving my position.

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I would further remark, that the "Druidenfuss" is mentioned in Göthe's "Faust."

Given the circle ABECD; let the regular octagon, whose side is *a* A, and regular pentagon, whose side is AB, be constructed within the said circle; draw the straight lines AC, AE, BD, BC, and ED, then draw the circle which passes through the points of intersection, *dmfgo*: to find whether the diameter, *on*, of the small circle, be equal to the side of the octagon, *a* A.